Sickness Absence: An International Comparison.*

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Abstract.

Previous attempts to analyse international differences in patterns of worker absenteeism have not been convincing because of the difficulty in obtaining internationally comparable data. In this paper, we apply the technique described by Barmby, Ercolani and Treble(1999) to data on full-time workers in 9 countries who have deposited Labour Force Survey returns with the Luxembourg Employment Study.

We use the resulting dataset to verify relationships between absence and age, gender and other socio-economic characteristics of workers. These relationships prove to be similar across countries with widely differing mean rates of absence.

Since our dataset uses individual observations we are also able to carry out a multivariate analysis of absence and its correlates. The most revealing result of the analysis is that the gender difference in absence rates that is apparent in the raw data is shown to be entirely due to differences in the age structures of the male and female workforce and their marital status.

1 Introduction.

The potential for learning more about the structure and causes of absenteeism from work has increased enormously in recent years, as new data sources and the computing power to analyse them have become available. It is now possible to undertake meaningful studies using individual data (Barmby, Orme and Treble 1991,1995), firm data (Lanfranchi, Skalli and Treble 1999), and national data (Barmby, Ercolani, and Treble 1999). The issues surrounding the determination of the absence rate demand treatment at all these levels, since the decision not to attend work is an individual decision, moderated by the contract of work and the policies of firms. Firms are themselves not typically free to adopt whatever policies they choose towards absence. National governments generally regulate sick pay provision, and in many cases operate sick pay schemes as part of the welfare system. The variety of policies at both firm and national level is extremely wide. For instance, the British

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regulatory system gives much scope to firms to provide company sick pay at more generous levels than the regulated minimum, and to structure it in ways that will provide appropriate incentives. A wide range of other forms of incentive, both financial and disciplinary, is also used. In France, state sick pay provision is more generous than in the UK. Firms nonetheless exercise the freedom that the system allows to provide more generous sick pay. As far as can be detected from the available data, this is nearly always structured in a similar fashion to the state scheme (Lanfranchi and Treble 1998).

Despite the usefulness of this work, it leaves one important aspect of absence unstudied. The connection between the structure and rates of sick pay and levels of sickness absence were established early in the systematic study of absenteeism by Denerley (1952) and Buzzard and Shaw (1952). The estimates of the size of the moral hazard effect in those papers, which are very large, have gone unheeded both in subsequent literature and, more importantly, in the formulation of public policy. National sick pay policies vary enormously across Europe and across the OECD countries. The USA has none, the UK regulates, while most other countries in Europe, not only regulate but also subsidise sick pay. Given the wide variations in the coverage of sick pay, monitoring arrangements, replacement ratios and other important aspects of sick pay, it is natural to try to assess the extent to which these create international variations in sickness absence. Such attempts in the past have failed because of the lack of statistics compiled on an internationally comparable basis.

Barmby, Ercolani and Treble (1999) demonstrate how to use the UK Labour Force Survey (LFS) to compute absence rates at the micro level. We have constructed a powerful tool to examine both aggregate trends in absence rates and the micro mechanisms generating absence within a country. Since the British LFS is one of a group of similar surveys run on a standardised basis in a large number of Western economies, we can apply the same techniques to those other countries. In the present paper we report our first attempts at this using the resources available at the Luxembourg Employment Study (LES).

2 Method of Analysis.

The Labour Force Surveys elicit information from respondents about absence in two ways. Both depend on the idea of a “reference week”, which is the last full week before the interview date. Respondents are asked if they worked during the reference

week. Those who answer "Yes", are then asked what their usual (LES variable FJ12) and actual hours (FJ13) of work are, and the reason for any difference (FJ14). If respondents say that they have not worked, they are asked why, to those claiming illness as the reason we assign an absence rate of 100%. We use this information to construct an absence rate during the reference week for full time employees.

As in Barmby, Ercolani and Treble (1999), we define the absence rate R_t as the ratio of the hours reported absent due to illness in the reference week (A_{it}) to contracted hours (C_{it}),

$$R_t = \frac{\sum_{i=1}^{n} A_{it}}{\sum_{i=1}^{n} C_{it}} \tag{1}$$

To construct A_{it}, our measure of absence hours due to illness, we take the difference between usual hours C_{it}^u and actual hours C_{it}^w and multiply it by an indicator of absence due to illness in the reference week, s_i. If $s_i = 1$, the absence is due to illness, and we want to include it. If $s_i = 0$, the absence is not due to illness, and we don't. Thus

$$A_{it} = (C_{it}^u - C_{it}^w)s_i \tag{2}$$

This measure may misrepresent absence in cases where overtime is worked. In the next section we argue that the error from this source is small.[1] The variables C_{it}^u, C_{it}^w and s_i are also used to construct the measure of contracted work hours C_{it} as

$$C_{it} = C_{it}^w(1 - s_i) + C_{it}^u s_i \tag{3}$$

This equation sets the employee's contracted hours equal to actual hours worked if there was no absence due to sickness in the reference week and equal to usual hours if there was some absence due to sickness[2].

3 International Comparability.

Our analysis refers to 8 European countries and Canada. These are all the countries for which the LES variables FJ12, FJ13 and FJ14 are available. These countries and the dates for which data are available are listed in Table 1. Note that only single years are presently available. Note too that this by no means exhausts the data that has been collected in the Labour Force Surveys, the UK alone has LFS data every year from

[1] It is possible for A_{it} constructed in this way to be negative in some cases. This occurred only in 0.02% of cases in Barmby, Ercolani and Treble (1999). We conclude that the error from this is very small.

1984 to the present, and many other countries are omitted altogether from the LES.

The availability of single years only poses some problems for statistical analysis of absence. For instance, we would like to examine the impact of sick pay on absence rates, but this is not possible with existing resources. There are many other features of economies that might impact on absence rates, so that it is necessary to have time variation in sick pay in order to be able to measure the extent to which it is the source of international differences.

Table 1: LES data sets

Country	Date
Canada	1997
Czech Republic	1994
France	1997
Luxembourg	1992
Slovenia	1994
Spain	1993
Sweden	1990
Switzerland	1997
United Kingdom	1989

Despite the claim of international comparability between LFS's, there remain several differences in the questionnaires' coding and which constrain the standardisation process of the LES. The main issue for our study is that the standardisation prevents us from identifying overtime in the reported usual hours. We therefore cannot exclude overtime from measured contracted hours. We can assess the extent of the bias induced by the omission by comparing the 1989 UK rates reported here and those in Barmby, Ercolani and Treble (1999). When overtime is excluded the overall rate is 3.17%, which decomposes into 2.87% for men and 3.82% for women. Comparable rates when overtime is included 3.21% overall, 2.91 % for men and 3.87% for women. These facts are inconsistent with the idea that absence on overtime hours should be lower, as the rate increases when we add overtime.

[2] Bliksvær and Helliesen (1997) used a measure of absence based only on observing whether an individual was absent from work for the *whole* of the reference week. This ignores short absences, which can constitute a large proportion of total absence (Barmby, Orme and Treble(1991)) and almost certainly underestimates the overall rate.

4 Summary Statistics.

Using the method outlined above, we obtain the statistics reported in Table 2. Explaining the differences in national absence rates constitutes a challenge for social science. One challenge is the doubt on the accuracy of reported sickness absence. The OECD (1998) suggests that the values for France, Luxembourg and Spain are probably underestimates of the true sickness absence and that the values for Canada, Sweden and the UK are probably quite accurate.

Subject to the above caveat on the accuracy of the data we make some tentative international comparisons. Sweden's apparent high absence rate may be due to the generous system of sick pay that was in place at the time of the data collection. France's sick pay system is also very generous, but France's absence rate seems low. The UK's regulated rates of sick pay are very small relative to both countries, but its absence rate lies between the two. Clearly a more sophisticated explanation is required than the simple generosity of sick pay provision in different economies. The second striking feature of Table 2 is that in all but three of the economies covered, male absenteeism is lower than female[3]. The exceptions are Luxembourg, Slovenia and Spain (where the two rates are close). The causes of this phenomenon are complex and possibly rooted in the relationship between household and market work, we intend to study this difference more in the future.

Table 2: Sickness Absence Rates by Country and Gender.

Date	Country	Female	Male	Total	Observations
1997	**Canada**	3.83 %	2.58 %	3.07 %	36,015
1997	**Czech Republic**	4.75 %	3.34 %	3.95 %	23,656
1997	**France**	2.76 %	2.49 %	2.59 %	42,835
1992	**Luxembourg**	1.62 %	1.92 %	1.83 %	5,345
1994	**Slovenia**	3.48 %	3.62 %	3.56 %	8,494
1993	**Spain**	2.47 %	2.49 %	2.48 %	39,019
1990	**Sweden**	8.42 %	5.13 %	6.31 %	24,933
1997	**Switzerland**	2.69 %	1.40 %	1.78 %	5,301
1989	**United Kingdom**	3.87 %	2.91 %	3.21 %	48,189

[3] This finding is contrary to the report by Bliksvær and Helliesen (1997). The difference is due to the fact that their measure of absence omits all short absences. These amount to about half of all absences.

5 Plots by Country and Socio-Economic Characteristics.

The simple facts about international absenteeism patterns can be better seen from the figures displayed below. Here we are able to represent the distribution of absence by age, gender, marital status, tenure, industry and occupation. These figures are similar to those reported in Barmby, Ercolani and Treble (1999), except that in that paper we were able to use the UK LFS surveys 1984-97 and show the development of absence patterns over time. Here, we are limited to a single year for each country and for some countries cell sizes are small producing more variable computed absence rates.

5.1 Plots by Country, Age and Gender.

The plots by country, age and gender are reported in figures 1.1 to 1.9. Each figure also displays regression lines to summarise the way absence varies with age and gender. The regressions are formulated as quadratic in age, fitted as least absolute deviations, with observations weighted by the square root of the cell sizes to compensate for heteroscedasticity and with a cut-off near retirement age. It should also be noted that the Canadian LFS reports only grouped age data. Where the number of observations is small (Luxembourg, Slovenia and Switzerland) the patterns show large variations as there appear to be too few observations to give an accurate representation of the age profile, particularly at the end points.

The plots show some interesting consistencies between the economies studied. For the most part, absence rates rise monotonically with age for both sexes, although there is some evidence that the age gradient is negative for young male employees. In the cases of France, Slovenia and Spain the sickness absence rate for young males appears to be higher than that for young females.

Figure 1.1 Decomposition of Absence by Age and Gender, Canada 1997.

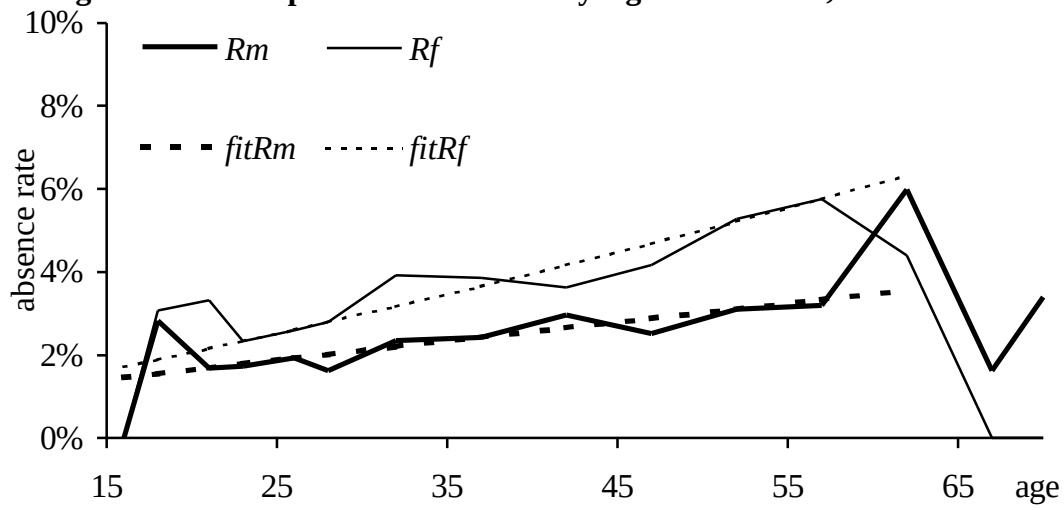


Figure 1.2 Decomposition of Absence by Age and Gender, Czech Republic 1994.

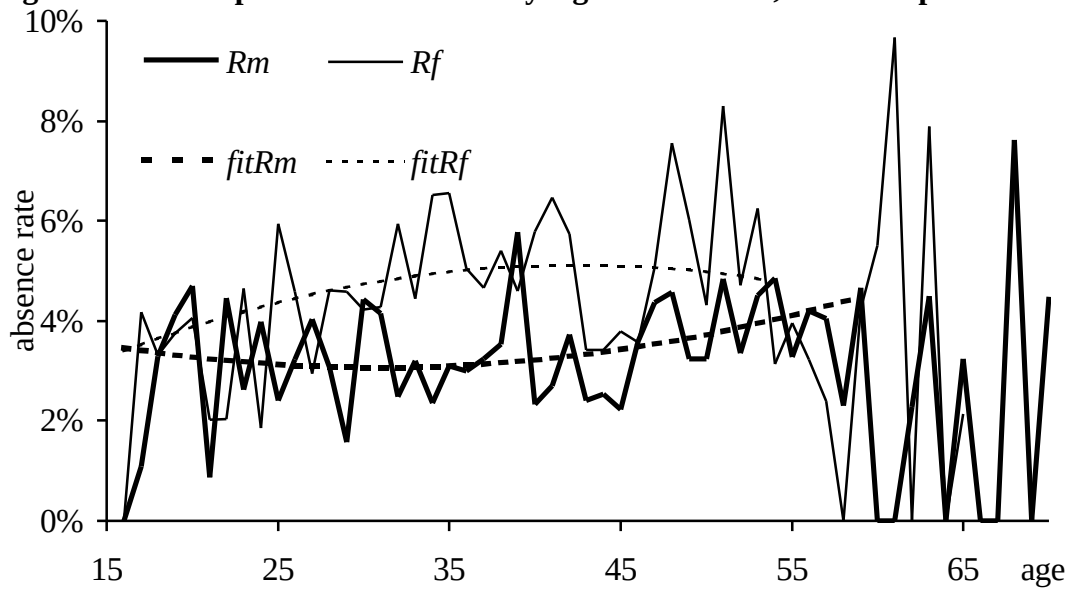


Figure 1.3 Decomposition of Absence by Age and Gender, France 1997.

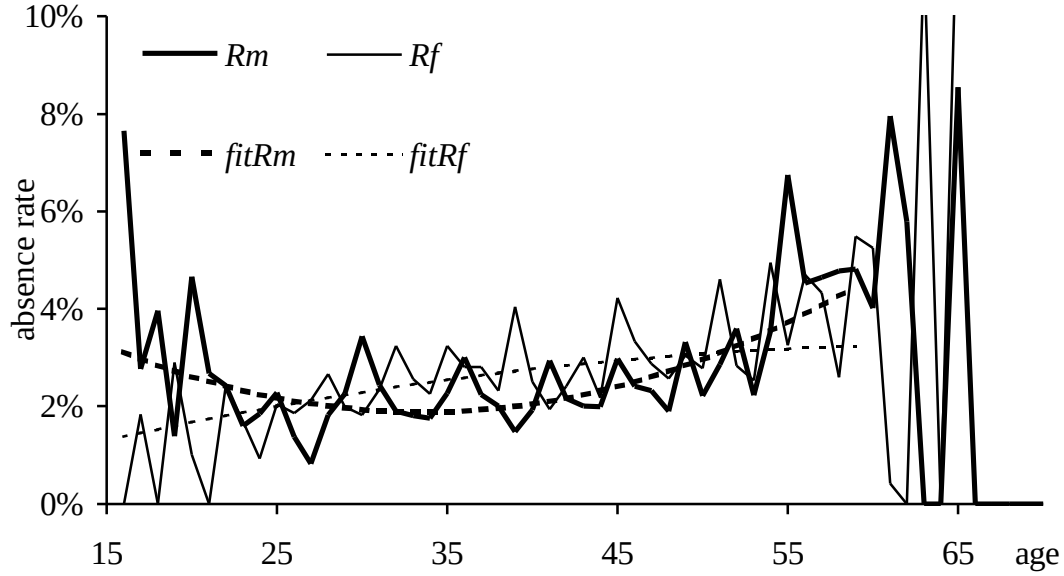


Figure 1.4 Decomposition of Absence by Age and Gender, Luxembourg 1992.

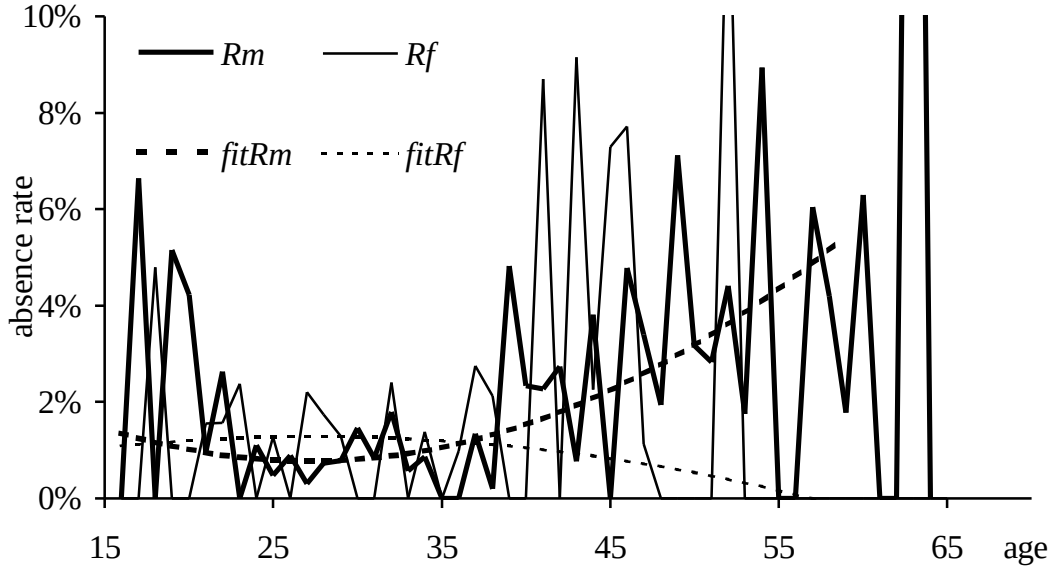


Figure 1.5 Decomposition of Absence by Age and Gender, Slovenia 1994.

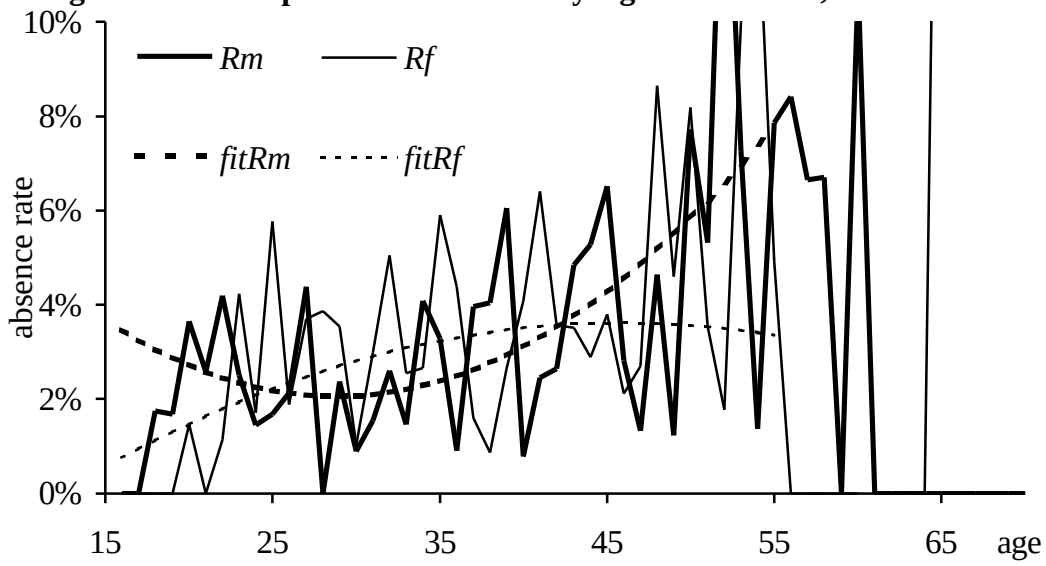


Figure 1.6 Decomposition of Absence by Age and Gender, Spain 1993.

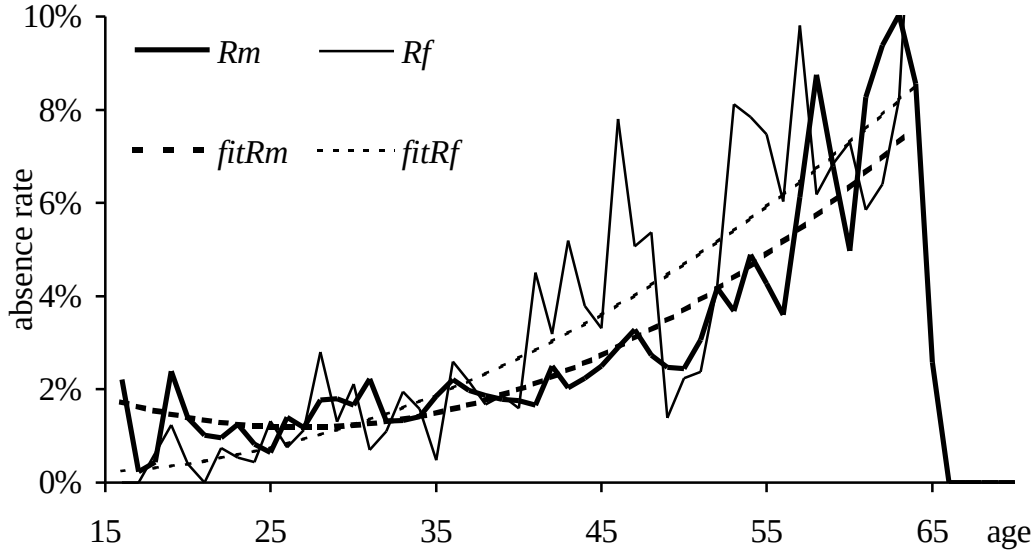


Figure 1.7 Decomposition of Absence by Age and Gender, Sweden 1990.

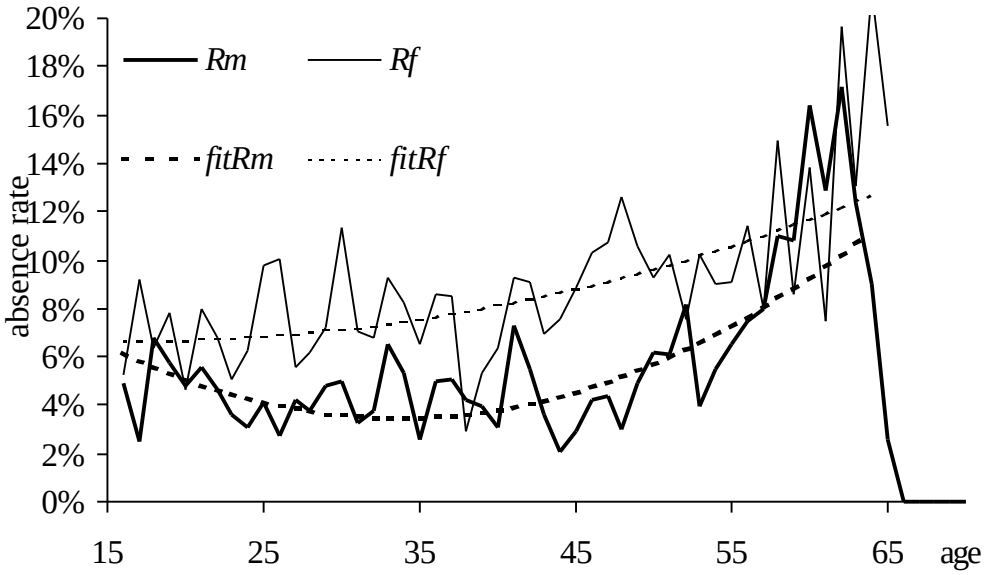


Figure 1.8 Decomposition of Absence by Age and Gender, Switzerland 1997.

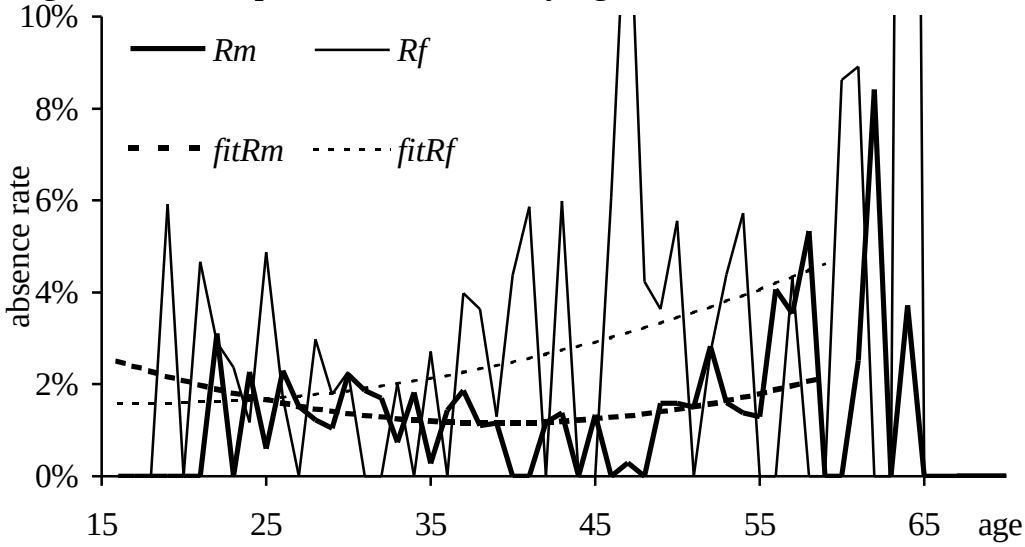
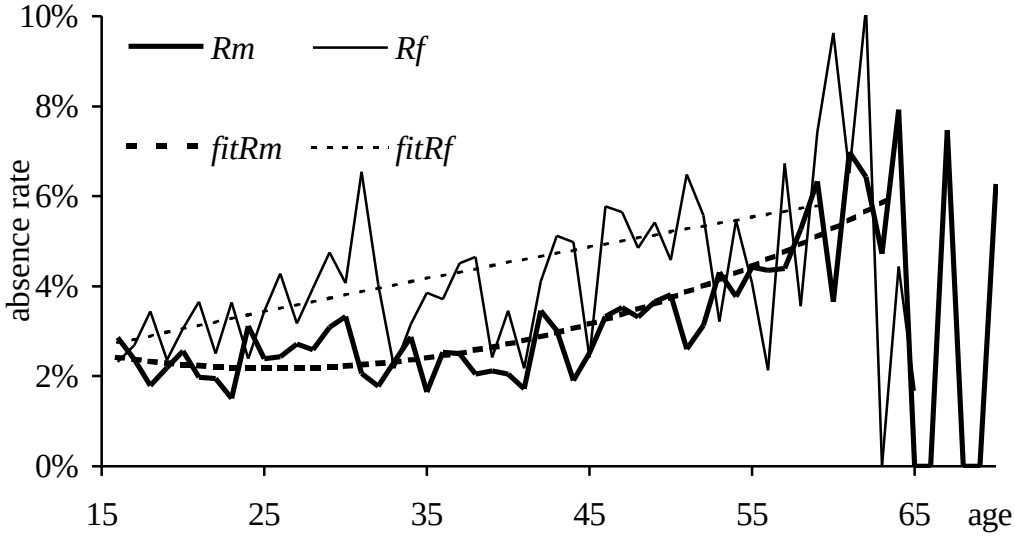


Figure 1.9 Decomposition of Absence by Age and Gender, United Kingdom 1989.



5.2 Plots by Country, Gender and Marital Status.

The differences is absence rates between male and female employees may be due to the different social obligations that men and women face. To capture this we plot the absence rate by gender and marital status of the respondent. We would have liked to plot this decomposition by gender and by the presence of dependent children in the household but information on the latter is unavailable for 5 of the countries in this set. We know from past research that in the case of the UK married refers to those who are legally married and those who are cohabiting as if a married couple, this definition was adopted in 1989. For the other countries we have insufficient documentation to identify the exact definition of marital status, we therefore take those who are married to be those who are legally married or possibly cohabiting as a married couple. Those who are single include those who have never been married, are divorced, separated or widowed. The singles category therefore cover a large age profile of the population.

The plots suggest that single men have the lowest absence rates while married women have the highest absence rates, this difference is possibly explained by different social responsibilities for gender groups outside the workplace. An exception to the general pattern can be observed in Luxembourg where single females have the lowest absence rates of any group across all 9 countries. Another exception is observed in Spain where marital status seems to matter but not gender.

Figure 2.1 Absence rate by Gender and Marital Status for all 9 Countries.

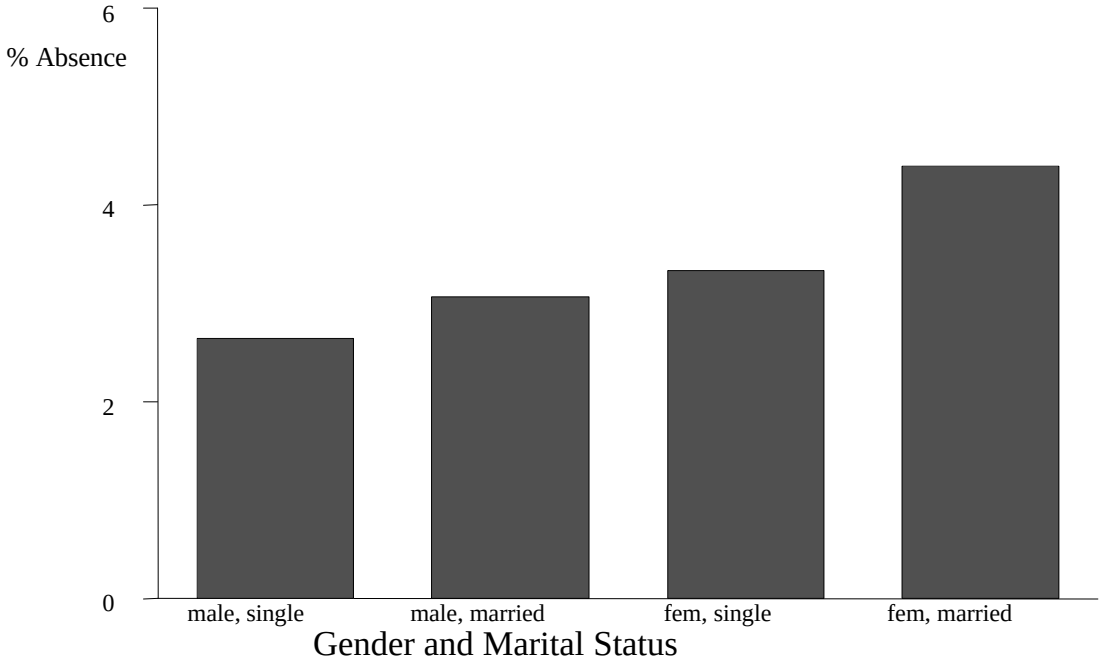
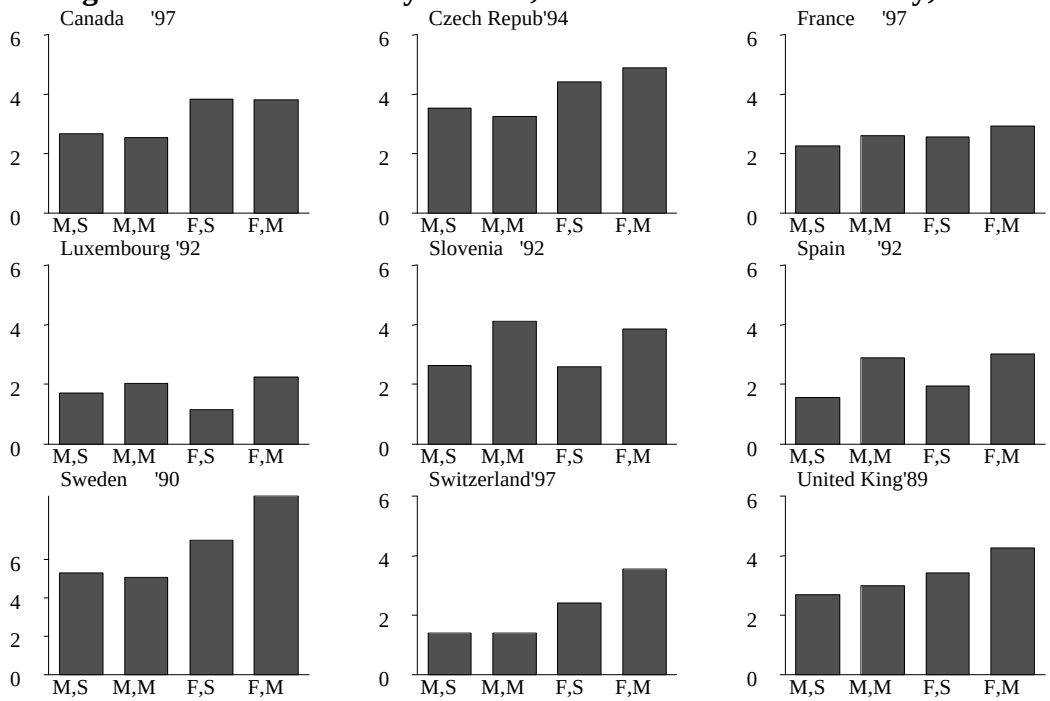


Figure 2.2 Absence rate by Gender, Marital Status and Country,



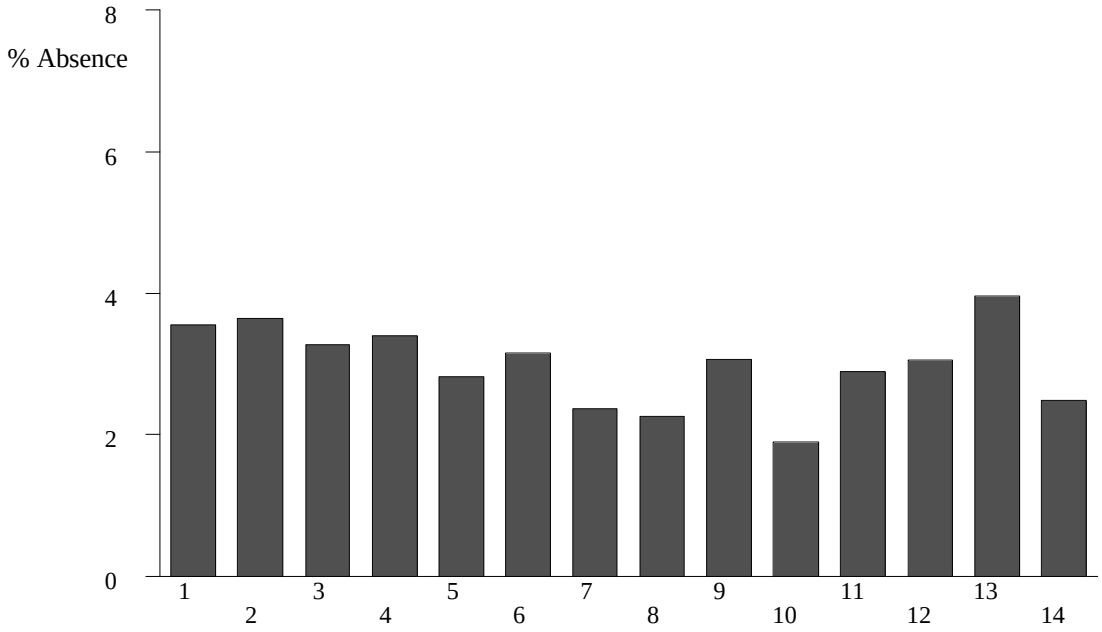
5.3 Plots by Country, Industry, Occupation and Tenure.

Presented below are the absence rates by various labour market characteristics, the choice of which is dictated by data availability. Figures 3.1 and 3.2 suggest that the heavy manufacturing industries are those with the higher absence rates, this can be attributed to the fact that employees in these industries are at higher risk from direct injury and exposure to factors that may lead to illness. The sector with the highest absence rate is “Health and Social Services” (13) whilst the sector with the lowest absence rate is “Financial and Related Services” (10).

In figures 4.1 and 4.2 we report decompositions of absence rates by occupation groups. With the exception of categories 0 “armed forces” and 6 “Skilled Agricultural and Fishery workers”, the lower numbers indicate a higher degree of responsibility in the workplace and these seem to have lower rates of sickness absence. Groups 7, 8 and 9 have been merged together in order to harmonize this variable for all 9 countries. Regression analysis for the subset of countries for which categories 7, 8 and 9 were available suggested that these three experiences similar propensities for sickness absence.

In figures 5.1 and 5.2 absence rates by tenure are reported for 6 of the 9 countries, these are only available by groups and not as a continuous variable. The univariate pattern here seems clear, employees with longer tenure experience longer absences. The possible explanations for the positive correlation are that employees with long tenures may perceive a higher degree of job security and may be more willing to make themselves absent in cases of mild illness. In addition, tenure is correlated with age and we have already observed that sickness absence increases with age. The multivariate analysis in the next section sheds light on this pattern by simultaneously controlling for both age and tenure. The patterns with respect to Luxembourg and Switzerland seem suspect but these are countries with relatively small sample sizes and therefore more subject to sampling error.

Figure 3.1 Absence rate by Industry for 8 Countries (Excluding Sweden).



Industrial Categories (and sample size)

1 Agriculture, Forestry & Fishing (6,843).
2 Extraction industries (3,327).
3 Food, Drink & Tobacco (6,756).
4 Manufacturing Industries (46,320).
5 Electricity, Gas & Water (3,135).
6 Construction (15,410).
7 Wholesale & Retail Trade (27,090).
8 Hotels & Restaurants (6,706).
9 Transport & Communication (14,944).
10 Financial & Related Services (20,784).
11 Public Administration (18,204).
12 Education (13,536).
13 Health & Social Services (16,312).
14 Personal & Recreational Services (9,021).

Figure 3.2 Absence rate by Industry and Country,

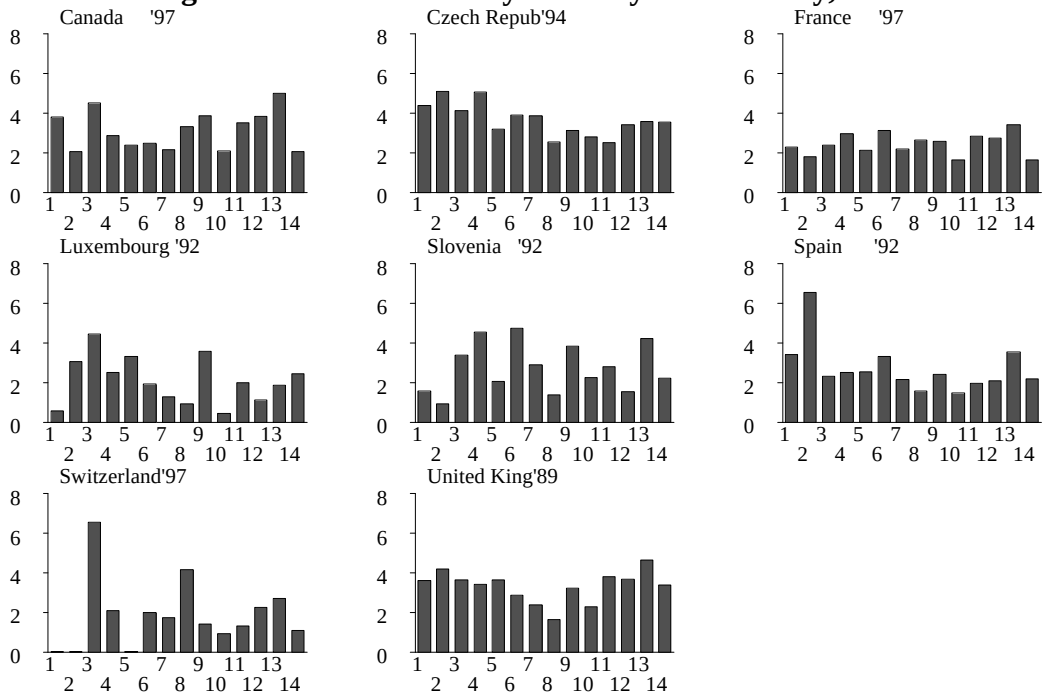
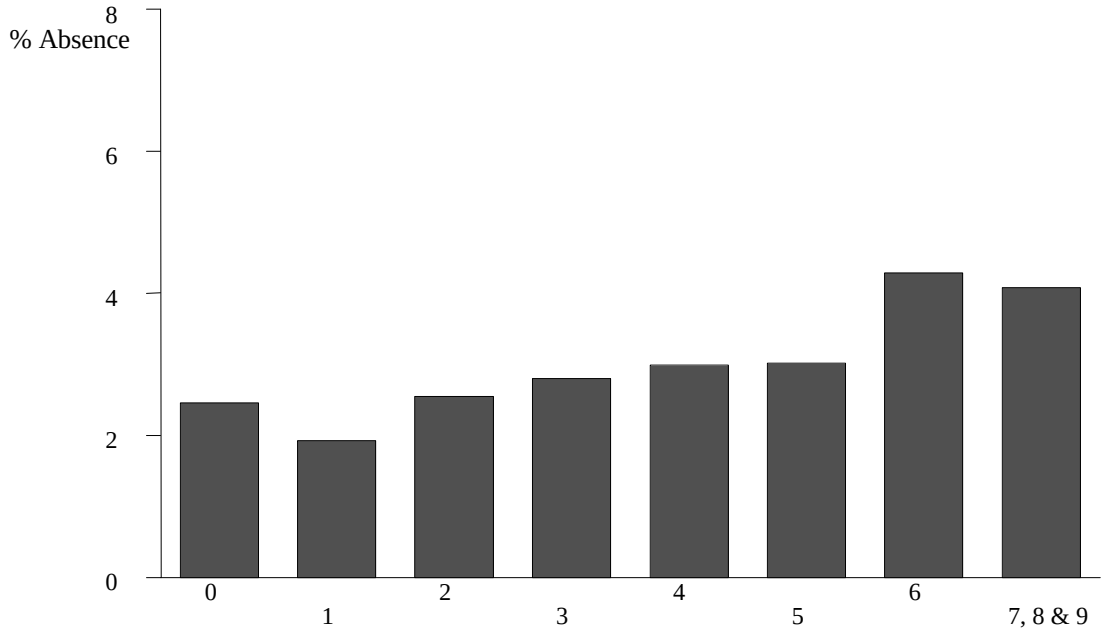


Figure 4.1 Absence rate by Occupation for all 9 Countries.



0 Armed Forces (941).
1 Legislators, Senior Officials and Managers (17,211).
2 Professionals (25,391).
3 Technicians and Associated Professionals (30,204).
4 Clerks (35,015).
5 Service workers and shop and market sales workers (27,723).
6 Skilled Agricultural and Fishery workers (4,031).
7 Craft and trade workers, 8 Plant and Machine operators & 9 Elementary Occupations (92,769).

Figure 4.2 Absence rate by Occupation and Country, excluding occupation category 0 because of small sample size.

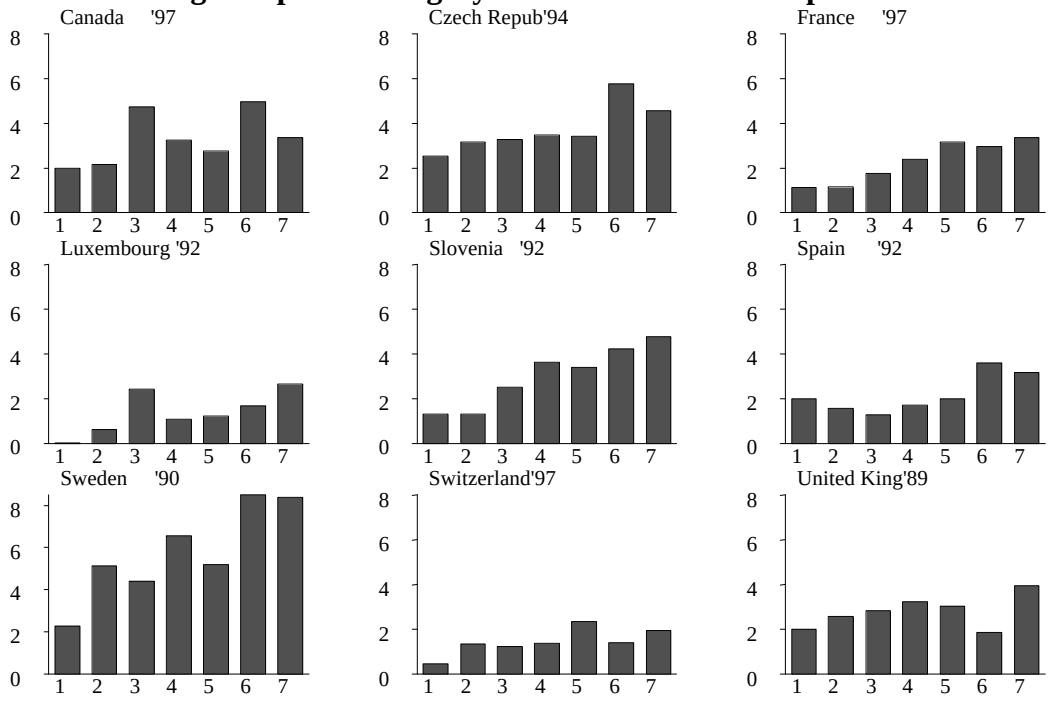


Figure 6.1 Absence rate by Tenure for 6 Countries, excluding Czech Republic, Slovenia and Sweden.

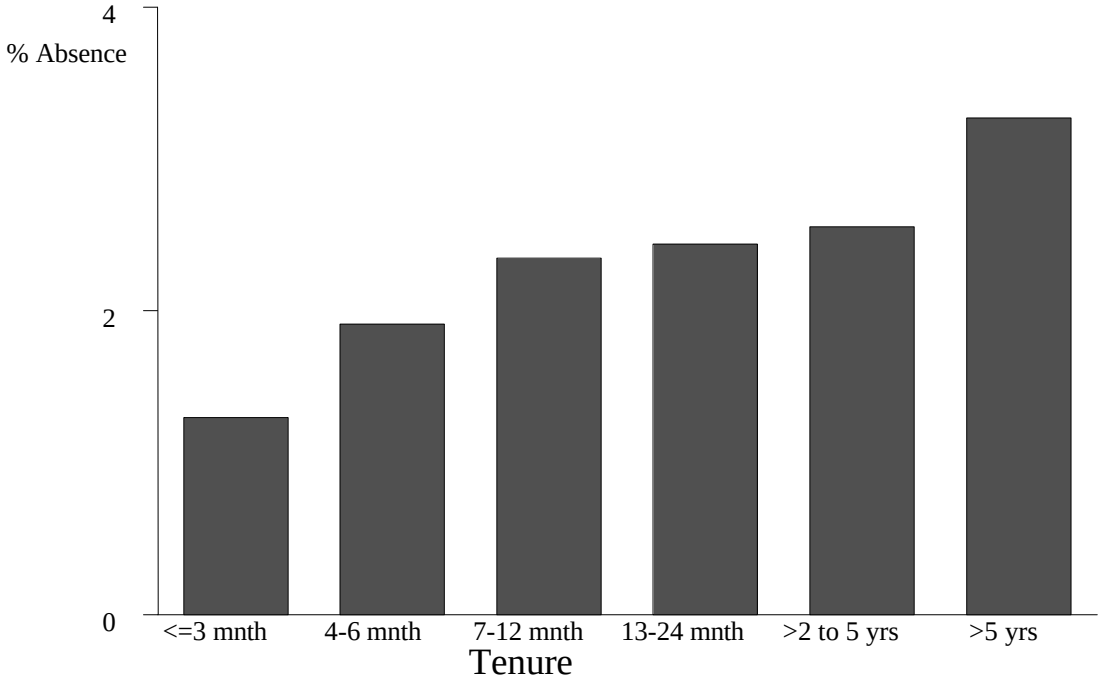
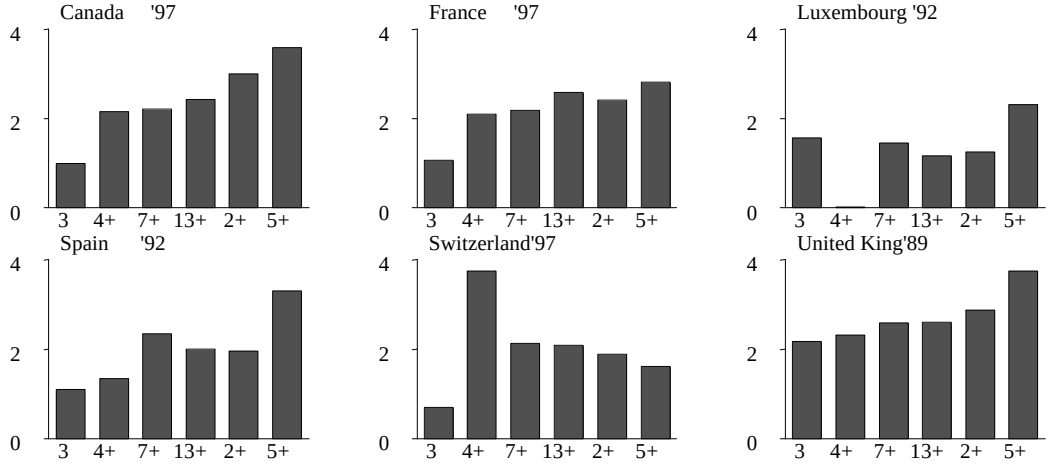


Figure 6.2 Absence rate by Tenure.



6 Multivariate Analysis

Finally, we have undertaken a multivariate analysis using OLS regressions with the individual absence rate as the dependent variable. The results of these confirm the message of the tables and plots discussed above.

A summary of the variable availability, by country, is given by table 3. Because of the limited variable availability we have chosen to run one set of regressions subject to country availability and another set of regressions subject to variable availability. The results of these are reported in tables 4 and 5 respectively. In addition to the above regressions we have sought to specifically model the differences in absence rates observed between countries by allowing for different absence/age profiles for each country. The results for these are reported in table 6.

Table 3: Variable availability by country.

Country	Gender	Age	Married	Usual hours	Industry	Occupation	Tenure
Canada	✓	✓	✓	✓	✓	✓	✓
Czech Rep.	✓	✓	✓	✓	✓	✓	
France	✓	✓	✓	✓	✓	✓	✓
Luxembourg	✓	✓	✓	✓	✓	✓	✓
Slovenia	✓	✓	✓	✓	✓	✓	
Spain	✓	✓	✓	✓	✓	✓	✓
Sweden	✓	✓	✓	✓	✓	✓	
Switzerland	✓	✓	✓	✓		✓	✓
U.K.	✓	✓	✓	✓	✓	✓	✓

The choice of OLS may seem odd given the non-normal distribution of the dependent variable and the obvious censoring at 0% and 100%. Alternative econometric specifications, which were tested, include probit, ordered probit and tobit. However, these specifications do not resolve the non-normal nature of the distribution as they still attempt to fit an underlying normal distribution by using limited information on the dependent variable. The ordered probit (ordered as not absent, partially absent and fully absent in the reference week) fares no better than OLS and the probit (ordered as not absent and otherwise) suffers from a high degree of collinearity between the dependent variable and the explanatory variable "Usual hours per week". The tobit regression, specified by setting the censoring for the dependent variable as $0\% \le R_i \le 100\%$, generates better R^2 scores but interpretation of the parameters is problematic because it seems to centre the mean absence rate a

somewhere around -800% to -1000%. This is because the mass of observations at 0% absence is about 96.5% of the sample and the tobit therefore models the observed distribution as the tail of a much larger distribution. Finally, we could have attempted to "bootstrap" the model in order to generate an appropriate distribution upon which to base the inference statistics. The computing resources necessary to do this are not at present available to us and we leave it for future investigation.

6.1 OLS regression for all 9 countries.

OLS regression results based on all 9 countries are reported in table 4. These regressions show that age and marital status explain the differences in absence rates between males and females. The results from the third regression in table 4 indicate that once gender differences in the age profile and marital status are accounted for, the gender dummy is statistically insignificant with a t-statistic of just -0.57.

The gender-specific regressions show that the age profile for females is not statistically significant while the one for males is highly statistically significant. Being married has significant and opposite effects for males and females, married men have a lower propensity for absence than unmarried men whilst married women have a higher propensity for absence than unmarried women. Usual hours per week seem to have a strong statistical impact on the propensity to be absent, for example, in the case of females an extra hour's work a week increases the propensity to be absent by 0.10% points.

All occupation groups seem to have lower propensity for absence than the control group "Other Occupations: Craft and trade workers, Plant and Machine operators & Elementary Occupations", though for "Armed Forces" and "Skilled Agricultural and Fishery workers" the reduction is statistically insignificant. Though we have included country dummies we are weary of their interpretation given we cannot exclude the possibility that observed differences between countries may be due in part to measurement error. Despite these misgivings we make some tentative observations on the calculated parameters. The UK is taken to be the control group with respect to which Canada and the Czech Republic do not seem to have substantially different absence rates. Sweden seems to have a statistically higher absence rate than the UK of 2.36% points for males and 4.06% points for females. We know that at the time of this survey state sickness benefits were particularly generous in Sweden as compared to other countries.

Table 4: OLS regression results for all 9 countries,

dependent variable is defined in percentage terms as $R_i = 100 * A_i / C_i$.

	Males		Females		Males & Females	
	coeff.	t-stat	coeff.	t-stat	coeff.	t-stat
Constant	1.98	3.75	0.17	0.22	1.45	2.70
Age	-0.13	-5.21	0.04	0.94	-0.11	-4.18
Age^2	0.27	8.74	0.05	1.08	0.25	7.58
Married	-0.19	-1.73	0.32	2.27	-0.26	-2.25
Usual Hours per Week	0.06	10.22	0.10	9.27	0.07	13.55
Occupation (other is control)						
Armed Forces	-1.05	-1.83	-1.42	-0.51	-1.06	-1.81
Legislators and Managers	-2.62	-13.52	-4.32	-11.11	-3.00	-16.88
Professionals	-2.26	-13.84	-3.20	-13.18	-2.36	-17.67
Technicians & Associated	-1.86	-12.59	-2.58	-10.84	-2.01	-16.08
Clerks	-1.00	-5.73	-2.69	-13.23	-1.68	-13.62
Service and sales workers	-1.23	-6.85	-2.31	-10.11	-1.53	-11.31
Skilled Agricolt. & Fishery	-0.01	-0.03	-0.85	-1.25	-0.14	-0.47
Country (UK is control)						
Canada	0.04	0.07	-1.18	-0.42	-0.33	-0.54
Czech Republic	0.23	1.36	-0.34	-1.37	0.15	1.07
France	-0.27	-1.89	-1.68	-7.73	-0.74	-6.19
Luxembourg	-0.76	-2.67	-2.44	-5.15	-1.21	-4.92
Slovenia	0.84	3.21	-1.26	-3.74	0.06	0.28
Spain	-0.55	-3.96	-1.89	-8.29	-0.90	-7.52
Sweden	2.36	14.53	4.06	16.20	3.02	22.00
Switzerland	-1.61	-5.48	-1.56	-2.93	-1.59	-6.05
Gender specific terms						
Female					-0.44	-0.57
Female * Age					0.10	2.25
Female * Age^2					-0.13	-2.38
Female * Married					0.68	3.95
Number of observations	140,130		82,026		222,156	
Significance of regression	$F^{19}_{140,110}$	=74.86	$F^{19}_{82,006}$	=66.11	$F^{23}_{222,132}$	=117.69
R^2	1.00%		1.51%		1.20%	

6.2 OLS regression for subset of 5 countries.

In Table 5, we report the results of an attempt to include tenure and industry in the analysis. Since there is no tenure variable in LES for the Czech Republic, Slovenia or Sweden, and since standardising the industry variable for Switzerland is problematic, these countries have to be omitted from the analysis. All the findings reported in table 4 seem to persist in the results reported in table 5, including the positive effect of usual hours per week.

Interestingly, tenure appears to have a positive impact on absence even when age is controlled for. The regression results indicate that the probability of absenteeism increases monotonically with tenure, in addition, the statistical importance of this affect also seems to increase monotonically. This stylized fact poses an interesting problem for contract theorists, is longer tenure correlated with greater job security and does this lead to a higher propensity for absence if illness arises?

The dummies that capture industry suggest that higher absence rates are correlated with those industries involved in heavy manual labour, including agriculture, extraction, manufacturing and construction. These are industries where employees are more likely to be exposed to direct injury. The industry with the largest parameter for absence is “Health & Social Services” and the industry with the lowest parameter for absence is “Financial & Related Services”. These results are consistent with the results discussed for the bar graphs in figures 3.1 and 3.2.

Table 5: OLS regression results for subset of 5 countries

dependent variable is defined in percentage terms as $R_i = 100 * A_i / C_i$.

	Males		Females		Males & Females	
	coeff.	t-stat	coeff.	t-stat	coeff.	t-stat
Constant	1.40	2.20	-0.23	-0.25	1.06	1.72
Age	-0.18	-6.03	-0.07	-1.62	-0.17	-5.74
Age^2	0.31	8.86	0.16	2.98	0.30	8.41
Married	-0.19	-1.60	0.08	0.55	-0.27	-2.21
Usual Hours per Week	0.06	10.22	0.09	8.17	0.07	12.46
Occupation (other is control)						
Armed Forces	-0.65	-1.07	-1.04	-0.40	-0.75	-1.24
Legislators & Managers	-1.98	-9.38	-2.98	-7.04	-2.24	-11.75
Professionals	-2.02	-10.58	-2.68	-8.64	-2.15	-13.36
Technicians & Associated	-1.44	-8.25	-2.07	-7.03	-1.60	-10.79
Clerks	-0.68	-3.63	-1.90	-7.97	-1.20	-8.88
Service and sales workers	-0.55	-2.51	-1.60	-5.76	-0.99	-6.13
Skilled Agricult. & Fishery	-0.26	-0.64	0.29	0.27	-0.12	-0.31
Country (UK is control)						
Canada	-0.10	-0.16	-0.99	-0.38	-0.32	-0.52
France	-0.21	-1.54	-1.71	-8.44	-0.71	-6.40
Luxembourg	-0.87	-3.13	-2.21	-4.90	-1.25	-5.29
Spain	-0.39	-2.96	-1.59	-7.48	-0.73	-6.45
Switzerland	-1.45	-5.17	-1.61	-3.24	-1.53	-6.21
Industry. (personal & recreation is control)						
Agricu, Forestry & Fishing	0.46	1.21	0.61	0.88	0.57	1.75
Extraction industries	1.13	2.85	-0.62	-0.52	1.06	3.00
Food, Drink & Tobacco	0.23	0.67	1.24	2.55	0.62	2.23
Manufacturing Industr.	0.28	1.05	0.78	2.49	0.51	2.58
Electricity, gas & water	0.54	1.30	-0.41	-0.47	0.47	1.29
Construction	0.71	2.41	-0.85	-1.32	0.77	3.34
Wholesale & retail trade	-0.05	-0.17	0.41	1.34	0.17	0.84
Hotels & Restaurants	-0.03	-0.08	0.42	1.03	0.29	1.06
Transport & Comm.	0.42	1.42	0.78	1.86	0.61	2.65
Financial & Related	-0.32	-1.07	0.29	0.94	0.01	0.03
Public Administration	0.45	1.50	1.21	3.59	0.80	3.66
Education	0.83	2.40	1.22	3.48	1.01	4.17
Health & Social Services	1.52	4.38	1.87	6.08	1.65	7.42
Tenure (1 to 3 months is control)						
1 to 3 months (control)						
4 to 6 months	0.54	1.99	0.95	2.42	0.67	3.00
7 to 12 months	0.95	4.12	1.41	4.22	1.11	5.78
13 to 24 months	1.06	4.57	1.65	4.97	1.26	6.65
over 2 to 5 years	0.84	4.02	2.08	6.81	1.29	7.45
over 5 years	1.18	6.09	2.31	7.91	1.57	9.65
Gender specific terms						
Female					-0.60	-0.70
Female * Age					0.09	1.87
Female * Age^2					-0.12	-2.01
Female * Married					0.45	2.46
Number of observations	107,703		59,311		167,014	
Significance of regression	$F^{34}_{107,668} = 27.25$		$F^{34}_{59,276} = 17.51$		$F^{38}_{166,975} = 38.91$	
R^2	0.85%		0.94%		0.88%	

6.3 OLS regression allowing for country specific age/absence profile.

We have noted from the above regressions that absence is higher among female than male employees, and rises with age. In the final regression we interact "Usual hours per week" and "age" with the country dummies so that the impact of contracted hours and age is measured for each individual country. Space constraints prevented including a full set of interactions with the sex variable as well as these others.

Nearly all the significant differences in absence rates between the countries are removed once these variables have been accounted for, except that there is still a 3.96% excess in the Swedish absence rate. This does not mean that the variance in absence itself is adequately described by this regression. The R^2 for the regression at 1.00% is very low even for data of this degree of complexity. Why absence in Sweden is different from other countries is a question worth pursuing in future research. The mean difference between the genders across all these economies is 1.2% points. The mean age profile is monotonic increasing and convex. There appear to be significant differences between the age profiles in different countries. Absence increases in contracted hours, but the effect is not present in Canada, the Czech Republic, France or Luxembourg. The effect is stronger in Sweden than in the UK, and much the same in the UK, Spain and Switzerland.

Table 6: OLS regression with interactions between country, age and usual hours per week, dependent variable is defined in percentage terms as $R_i = 100 * A_i / C_i$.

	Males & Females	
	coeff.	t-stat
Constant	0.32	0.43
Female	1.18	15.61
Age (UK is control group)	-0.13	-3.30
Age * Canada	0.14	2.14
Age * Czech Republic	0.26	3.88
Age * France	0.00	0.03
Age * Luxembourg	0.13	0.88
Age * Slovenia	0.09	0.71
Age * Sweden	-0.39	-5.41
Age * Spain	-0.06	-1.05
Age * Switzerland	-0.01	-0.04
Age^2	0.24	4.77
Age^2 * Canada	-0.19	-2.21
Age^2 * Czech Republic	-0.38	-4.46
Age^2 * France	-0.01	-0.11
Age^2 * Luxembourg	-0.13	-0.68
Age^2 * Slovenia	-0.03	-0.20
Age^2 * Sweden	0.57	6.17
Age^2 * Spain	0.18	2.39
Age^2 * Switzerland	-0.03	-0.15
Usual hours per Week	0.09	10.08
Usual hours * Canada	-0.07	-4.46
Usual hours * Czech Republic	-0.06	-2.91
Usual hours * France	-0.07	-4.23
Usual hours * Luxembourg	-0.08	-1.61
Usual hours * Slovenia	-0.03	-0.76
Usual hours * Sweden	0.13	5.15
Usual hours * Spain	0.01	0.70
Usual hours * Switzerland	0.00	0.02
Country		
Canada	0.20	0.14
Czech Republic	-0.53	-0.35
France	2.44	1.63
Luxembourg	-0.40	-0.12
Slovenia	-1.23	-0.44
Sweden	3.96	2.43
Spain	-1.35	-1.06
Switzerland	-0.59	-0.17
Number of observations	221,623	
R^2	1.00%	

7 Conclusion.

The main objective of this paper has been to make an international comparison of sickness absence behaviour for 9 countries who deposit their Labour Force Surveys at the Luxembourg Employment Study.

Economic models of absence behaviour[4] stress the importance of labour supply and demand in the determination of absence rates. The results we describe illustrate several aspects of this. In most countries, women have higher absence rates than men. We have shown that these difference can be entirely accounted for by differences in the age structures of the male and female workforces, together with marital status. The age profile is rather difficult to interpret, since the data we use is not a true panel. The age profile is affected not only by the changing propensities of employees to attend as they get older, but also by the fact that the group of older employees is a selection from the relevant cohort. Employees who drop out of the labour force may do so for a variety of reasons, some of which will be health related. If the distribution of sickness is changing among each cohort as it ages and is being truncated in the upper tail, the net impact on absence is unpredictable. The fact that absence tends to increase with age despite the attrition implies that the estimated slope of the age profile is biased downwards. A further complication in interpreting these results arises because absence rates are affected by moral hazard as well as by any objective notion of morbidity.

There are many aspects of sickness absence that are not studied in the present paper but we hope to have more to say in the near future. It would also be helpful if the LES data could be expanded to give more time variation for each country. Combined with extraneous information about sick pay in the various countries, this would possibly enable us to identify financial incentive effects, and to be able to disentangle the determinants of absence with a greater degree of confidence than has been possible in the past.

Finally, the results suggests another fascinating extension. The literature on social capital and health claims that the degree of income inequality is an important determinant of the health status of nations. The literature relies entirely on mortality measures to represent health. An alternative approach is to use data on sickness absence. Although it is tainted by incentive problems, it should be possible to control

[4] Allen(1981), Coles and Treble(1994, 1996).

for these, and determine whether the relationship that has been claimed on the basis of mortality statistics, also holds for a measure that is more closely related to morbidity.

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